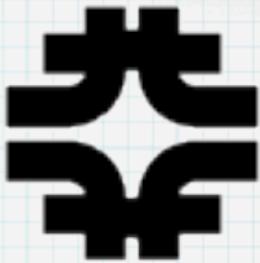




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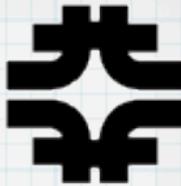
Beam Simulations the unification dk2nu

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Beam Simulation Mtg 2012-11-08 revised 2012-11-21



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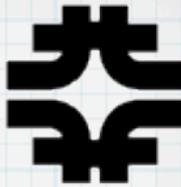


Unified Beam Ntuple format

- Some recent refinements
- Added (preliminary code) to nusoft repository, as “dk2nu”
 - subdir for tree structures, GENIE interface, scripts, documents
- Proposal: [MINOS-DocDB-9070](#)
 - initial version publicly visible on 2012-05-02
 - accompanying talk [MINOS-DocDB-9084](#)
 - access changed from “beamrw” to “public”
 - also recent Joint NuMI Beam talk: [MINOS-DocDB-9453](#)



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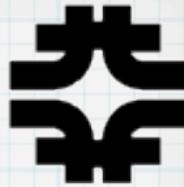


Outstanding Questions

- Should tree name == class name? **no**
 - cause of confusion? perhaps “dk2nuTree”
 - `class bsim::Dk2Nu, tree dk2nuTree, branch dk2nu`
- Hierarchical vs. flat structure
 - `dk2nuTree->Draw("nType")` VS. `dk2nuTree->Draw("decay.nType")`
 - if no name clashes then “decay.” can be skipped **done**
 - provides grouping (in browser and in class structure)
 - easier to exclude branches from reading (speedup)
- Leaves
 - what to exclude (duplication, test purposes, etc)
 - exact name choices **still in “flux”**
 - exact intent of the variable **a few still unclear** (e.g. `pprodpx`)



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Class Structure



- Hierarchical vs. flat structure

- currently flat

```
class dk2nu {  
    int ntype;  
    double nimpwt;  
    ...  
    vector<int> apdg;  
    ...  
};
```

- `dk2nu->Draw("ntype:apdg[0]")`

```
class bsim::Decay {  
    int ntype;  
    double nimpwt;  
    ...  
};
```

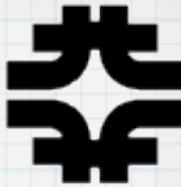
```
class bsim::Ancestor {  
    int pdg;  
    ...  
};
```

```
class bsim::Dk2Nu {  
    Decay decay;  
    vector<bsim::Ancestor> ancestor;  
    ...  
    int idxnu() const;  
};
```

- `dk2nuTree->Draw("decay.ntype:ancestor[0].pdg")`
- `dk2nuTree->Scan("ntype:ancestor[idxnu()].pdg")`
 - using Dk2Nu class method `idxnu()` from library
 - broken for g4minerva files that overflow stored 10 ancestor limit
 - `"ntype : ancestor[idxnu()].pdg : overflow()"`



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Access to the code

- UPS version:

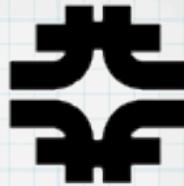
- ```
source /nusoft/app/alt/setup.sh
```
- ```
setup genie v3665 -q e2:debug # get GENIE + ROOT + gcc setup
```
- ```
setup dk2nu test3 -q e2:debug # new version 2012-11-21
```

- Self-build:

- ```
export CVS_RSH=ssh
```
- ```
export CVSROOT=:pserver:anonymous@cdcvs.fnal.gov:/cvs/projects/nusoftart
```
- ```
/usr/bin/cvs -d $CVSROOT checkout dk2nu
```
- ```
export DK2NU=/path/to/dk2nu
```
- ```
cd $DK2NU ; gmake # assuming you have ROOT + gcc ( + GENIE ) setup
```



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Trying the code - interactive

- Run code to load library, read locations file

- cat \$DK2NU/etc/locations.txt
 - root \$DK2NU/snippets/load_dk2nu.C \$DK2NU/snippets/test_read_locations.C

```
bsim:::Dk2Nu dk2nu; // create one entry out of whole cloth  
dk2nu.job = 42; dk2nu.decay.ntype = 14; // modify it  
cout << dk2nu << endl; // have it print itself
```

- Run on a file (/nusoft/data/flux/dk2nu/test2)

- root \${DK2NU}/snippets/load_dk2nu.C generic_flugg_to_dk2nu.root

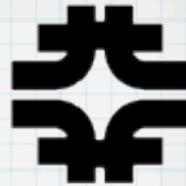
~~dkmetaTree->Scan("location.name","","colszie=25");~~

doesn't show all entries due to root looping bug ([Savanna report 98899](#))

```
TCanvas* c1 = new TCanvas(); c1->SetLogy();  
dk2nuTree->Draw("nuray[1].E","nimpwt*nuray[1].wgt"); // minos near flux  
dk2nuTree->SetLineColor(kRed);  
dk2nuTree->Draw("nuray[3].E","nimpwt*nuray[3].wgt","SAME"); // nova near flux
```



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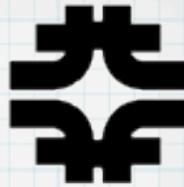
Trying the code - ancestor list



- Run on a g4minerva file (/nusoft/data/flux/dk2nu/test2)
 - root \${DK2NU}/snippets/load_dk2nu.C generic_g4minerva_to_dk2nu.root
 - dk2nuTree->Draw("@ancestor.size()"); // how many ancestors in chain?
 - "@" allows ".size()" to work on collection rather than individual elements
 - dk2nuTree->Scan("pdg[@ancestor.size()-1]","! overflow()");
 - selects cases where there was an overflow, last entry is not neutrino (181/144078)
 - try without conditional (see most cases are neutrinos); apdg[0]=2212=proton
 - added functions: overflow(), idxnu(), idxxp(), idxgp() (nu, parent, grandparent)
 - dk2nuTree->Scan("ntype:pdg[idxnu()]","! overflow()"); // nu's pdg
 - try other things



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Trying the code - compiled

- Run code to load library, read locations file

```
• root $DK2NU/snippets/load_dk2nu.C \
 '$DK2NU/snippets/test_read_dk2nu.C+\'
 (" /nusoft/data/flux/dk2nu/test/generic_g4minerva_to_dk2nu.root " )'
```

```
#include <iostream>
#include <iomanip>
#include <string>
using namespace std;
#include "TChain.h"
#include "dk2nu/tree/dk2nu.h"
#include "dk2nu/tree/dkmeta.h"

void test_read_dk2nu(string
pattern="generic_g4minerva*.root")
{
```

```
    TChain* cflux = new TChain("dk2nuTree");
    TChain* cmeta = new TChain("dkmetaTree");
```

```
    cflux->AddFile(pattern.c_str());
    cmeta->AddFile(pattern.c_str());
```

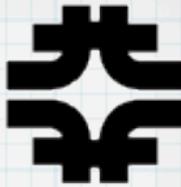
```
    bsim::Dk2Nu* dk2nu = new bsim::Dk2Nu;
    bsim::DkMeta* dkmeta = new bsim::DkMeta;
    cflux->SetBranchAddress("dk2nu",&dk2nu);
    cmeta->SetBranchAddress("dkmeta",&dkmeta);

    Long64_t nflux = cflux->GetEntries();
    Long64_t nmeta = cmeta->GetEntries();
    cout << "nentries: " << nflux << " " << nmeta << endl;

    for (Long64_t i=0; i < nflux; ++i) {
        cflux->GetEntry(i);
        if ( i < 50 ) cout << "ntype " << dk2nu->ntype << endl;
    }
}
```



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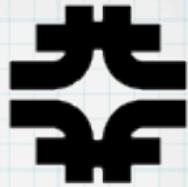


Converting the ntuple

- Different for each “flavor” (flugg, g4minerva, etc)
 - cat \$DK2NU/etc/locations.txt
 - root \$DK2NU/snippets/load_dk2nu.C \
 '\$DK2NU/convert/flugg/convert_flugg.C+("myflugg.root",42,"MINOS")'
 - resulting file: myflugg_to_dk2nu.root
 - Similar for g4minerva (+ eventually g4numi, g3numi)
- Conversion attempts some cross checks
 - flugg compares re-calculated energy/weight to what is in the original file for Near/Far
 - thus the need to know whether it is a MINOS or NOvA generated file
 - g4minerva tests whether startxyz[i] == stopxyz[i-1]
 - g4minerva has odd placement for NOvA locations (?near); far is well off actuality
 - g4minerva location energy+weights match up well, except “MiniBooNE” weight (energy okay)



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Dragons ...





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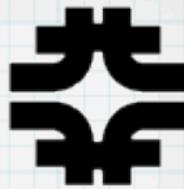


Merging CVS Repositories

- Two phases
 - create CVS repository with all versions on branches
 - fix up CVS *,v files to get commit timestamp/authors right
- First phase: done
 - complex bit of bash scripting to parse CVS log files

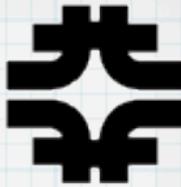
	RCS files	logs (dir)	commits
MINOS	1119	2451 (65)	---
NOvA	1129	3166 (15)	1458
Minerva	601	1326 (9)	831

- changed files, added file & directories, removed files
- **not as complete as I thought on Thursday (2012-10-18)**
 - revisiting ...





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Merging CVS Repositories

- Second phase: understood
 - complex bit of bash scripting to hack up ,v files
 - “sed” is not quite the right tool, and I’m not sure what is
 - but a bit complicated ... I found something that should work

```
sed --copy --in-place=.sed.bak --file=${sedscript} ${workingfile}

/^1.1.2.10$/ {
    # found revision #, append a line
    N
    # find the 2nd pattern on the next line
    /\ndate.*2012.10.16.20.03.12.*author.*rhatcher/ {
        # found it, now edit making the date, author right
        s/2012.10.16.20.03.12/2012.07.25.21.36.40/
        s/rhatcher/corwin/
    }
}
```

- need to fix problems w/ stage 1 first



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Checkout code copy



- Ideally:
 - `export CVS_RSH=ssh`
 - `/usr/bin/cvs -d :pserver:anonymous@minoscvs.fnal.gov:/cvs/minoscvs/rep1 \checkout -d numisoft -r nova numisoft_thedancemix`
- But that is not right, so I took a copy of nusoft:
 - `/usr/bin/cvs -d :pserver:anonymous@minoscvs.fnal.gov:/cvs/minoscvs/rep1 \checkout -d numisoft numisoft_cp_nusoft`
- -d flag, twice?
 - first flag is for `/usr/bin/cvs`, like `$CVSROOT`
 - second flag is for `checkout`, modifies output directory to different from module name